IN THE CLAIMS:

1. (Original): A method of controlling a magnetostrictive actuator, the method comprising:

energizing a coil with a current to generate magnetic flux within the coil;

measuring the amount of magnetic flux generated in the coil; and

applying the magnetic flux generated in the coil as feedback variable to selectively control the amount of magnetizing force applied to a magnetostrictive member located within the coil.

2. (Currently Amended) The method according to claim 18, wherein the measuring flux comprises sensing with a Hall-effect sensor.

3. (Currently Amended) The method according to claim 18, wherein the measuring flux comprises sensing with a Giant Magnetoresistive (GMR) sensor.

4. (Currently Amended) The method according to claim 18, wherein the measuring flux comprises sensing with an eddy current sensor.

5. (Currently Amended) The method according to claim 18, wherein the measuring flux comprises integrating a time-derivative of magnetic flux.

6. (Original) The method according to claim 5, wherein the integrating comprises measuring a voltage across a sense coil to determine the time-derivative of magnetic flux.

7. (Currently Amended) ~~The~~ A method ~~according to claim 5~~ of controlling a magnetostrictive actuator, the method comprising:

energizing a coil with a current to generate magnetic flux within the coil;

measuring the amount of magnetic flux generated in the coil, the measuring flux comprises integrating a time-derivative of magnetic flux~~wherein~~, the integrating ~~comprises~~ includes measuring a voltage across an inactive one of two drive coils to determine the time-derivative of magnetic flux; and

applying the amount of magnetic flux generated in the coil as feedback variable to selectively control the amount of magnetizing force applied to a magnetostrictive member located within the coil.

8. (Currently Amended) The method according to claim 18, wherein the applying the amount of magnetic flux further comprises correcting for thermal variations.

9. (Currently Amended) The method according to claim 8, wherein the correcting for thermal variations comprises adding a thermal correction factor to a first setpoint level to generate a second setpoint level.

10. (Previously Presented) A method of controlling a magnetostrictive actuator, the method comprising:

energizing a coil with a current to generate magnetic flux within the coil;

measuring the amount of magnetic flux generated in the coil; and

applying the amount of magnetic flux generated in the coil as a feedback variable to selectively control the amount of magnetizing force applied to the magnetostrictive member located within the coil, and includes correcting for thermal variations, the correcting for thermal variations includes adding a thermal correction factor to a first setpoint level to generate a second setpoint level, wherein the thermal correction factor is determined based on resistance of the coil.

11 (Original) The method according to claim 10, wherein the resistance of the coil is determined by dividing voltage across the coil by a voltage drop across a sense resistor which is proportional to current through the coil.

12. (Original) The method according to claim 11, wherein the coil resistance is determined when the time derivative of flux is zero and the drive coil current is not zero.

13. (Currently Amended) The method according to claim 10, wherein the resistance of the coil is approximately by subtracting voltage across the coil from a voltage which is proportional to ~~to~~ the current through the coil.

14 (Original) The method to claim 13, wherein the coil resistance is determined when the time derivative of flux is zero and the drive coil current is not zero.

15-17 (Canceled).

18. (Previously Presented) A method of controlling a magnetostrictive actuator having a current driver, a coil electrically coupled to the driver and a magnetostrictive member proximate to the coil, the magnetostrictive member being responsive to a magnetizing force generated by the coil, the method comprising:

measuring a flux set point at a predetermined current level of the coil;

detecting the amount of change in magnetic flux as compared to the flux set point; and

applying the amount of change in detected magnetic flux to the current driver as a feedback variable to control the magnetizing force.

REMARKS

The non-final Office Action issued 15 May 2003 has been reviewed and the comments of the U.S. Patent and Trademark Office have been considered. Claims 2-5, 7, 8, and 13 have been amended. Claims 15-17 were canceled without prejudice or disclaimer in the Amendment filed 23 December 2002. Claims 10-14 and 18 have been allowed. Accordingly, Applicant requests reconsideration of the pending claims 1-14 and 18.

Applicant thanks the Examiner for indicating that claims 10-14 and 18 have been allowed. Applicant also thanks the Examiner for indicating that claim 7 would be allowable if rewritten into independent form. Claim 7 has been so rewritten. Accordingly, claims 7, 10-14, and 18 are in condition for allowance.

Applicant respectfully notes that claims 2-5 and 8 have been amended so that they depend upon allowed claim 18. Hence, claims 2-5, 8 are in condition for allowance, inasmuch as they depend from allowed claim 18, as well as for reciting additional features.

In the Office Action, claim 3 stands rejected under 35 U.S.C. §103 as being unpatentable over Hasselmark in view of U.S. Patent No. 6,181,036 to Kazama *et al* ("Kazama"); claims 4 and 8 stand rejected under 35 U.S.C. §103 as being unpatentable over Hasselmark in view of U.S. Patent No. 6,288,536 to Mandl *et al* ("Mandl"); claims 5 and 6 stand rejected under 35 U.S.C. §103 as being anticipated by Hasselmark in view of U.S. Patent No. 6,208,497 to Seale *et al* ("Seale"). In view of the amendment to claims 2-5 and 8, these rejections are now rendered moot.

Claims 1 and 2 stand rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 4,585,978 to Hasselmark *et al* ("Hasselmark").

Applicant respectfully traverses the rejection to claim 1, as Hasselmark fails to teach or suggest the claimed invention as a whole.

Claim 1 recites a method of controlling a magnetostrictive actuator that can be achieved, in part, by measuring the amount of magnetic flux generated in the coil; and applying the

magnetic flux generated in the coil as a feedback variable to selectively control the amount of magnetizing force applied to a magnetostrictive member located within the coil.

The Office Action states that magnetic flux density and magnetic flux to be the same such that Hasselmark anticipates the claimed invention as a whole, as recited in claim 1. Applicant respectfully asserts that magnetic flux density is dependent upon a magnitude of the magnetic flux or field lines passing through an area of a material—whereas magnetic flux form magnetic field lines irrespective of such area of the material. And because Hasselmark employs magnetic flux density to feedback control displacement of the magnetostrictive rod 54 instead of only magnetic flux alone to control a magnetizing force in a coil, Hasselmark fails to teach or suggest features of the claimed invention as whole, as recited in claim 1.

In particular, Hasselmark states, at column 2, lines 67-68, that a magnetic flux density (represented by the symbol $\mathcal{B}$ in Hasselmark) within a magnetostrictive rod 54 can be used to provide displacement feedback of an actuator 22 of Hasselmark (column 4, lines 36-40). As known to a person of ordinary skill in the art, the magnetic flux density $\mathcal{B}$ represents magnetic flux (represented by the symbol Ø) propagating over a perpendicular area A of a material, such as the rod 54, where $\mathcal{B} = Ø/A$. Hence, the magnetic flux <u>density $\mathcal{B}$</u> is dependent upon the perpendicular area A of the magnetostrictive rod 54—whereas a magnetic <u>flux Ø</u> generated by a coil is independent of the perpendicular area A of a material in which the magnetic flux Ø propagates therethrough. Because Hasselmark senses magnetic flux density $\mathcal{B}$, which is dependent upon a perpendicular area A of the rod 54, Hasselmark fails to support the conclusion by the Examiner that the sensed magnetic flux density $\mathcal{B}$ and magnetic flux Ø to be the same such that Hasselmark anticipates the claimed invention as a whole.

Furthermore, because an extension E of the magnetostrictive rod 54 is proportional to the magnetic flux density $\mathcal{B}$ in the rod 54 (column 4, lines 36-43), Hasselmark states that this proportional relationship results in the ability of the induction sensor signal (which senses magnetic flux density $\mathcal{B}$) to provide for a closed loop control of displacement D of the actuator 22. Because Hasselmark employs magnetic flux density $\mathcal{B}$ for closed loop control of

displacement D of the actuator 22, Hasselmark fails to show or describe utilizing magnetic flux alone to compensate for the magnetic flux variations in the actuator due to variations such as, for example, prestress loads and thermal demagnetization, as described in the applicant's disclosure at, for example, pages 7 and 8. Thus, Hasselmark fails to teach or suggest measuring the amount of magnetic flux generated in the coil; and applying the magnetic flux generated in the coil as a feedback variable to selectively control the amount of magnetizing force applied to a magnetostrictive member located within the coil, as recited in claim 1. Accordingly, claim 1 is patentable because Hasselmark fails to teach or suggest features of the claimed invention as a whole.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully requests the reconsideration and reexamination of this application and allowance of the pending claims 1-14 and 18. Applicant respectfully invites the Examiner to contact the undersigned at (202) 739-5203 if there are any outstanding issues that can be resolved via a telephone conference.

EXCEPT for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. §1.136(a)(3).

Respectfully submitted,

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